WE CLAIM:

1. A laterally translatable pressure staged shaft sealing mechanism comprising:

(a) a housing being exposed to a first fluid at a pressure P1;

(b) a relatively rotatable surface being located for relative rotation with respect to said housing

(c) laterally translatable annular seal carrier means having laterally translatable movem relative to said housing responsive to lateral movement of said relatively rotatable surface;

(d) first and second annular resilient sealing elements being supported in axially spaced relat by said laterally translatable annular seal carrier means and having interference sealing relation with s laterally translatable annular seal carrier and said relatively rotatable surface and defining a staging press chamber between said first and second annular resilient sealing elements; and

(e) means communicating a second fluid at a staging pressure P2 to said staging press chamber at a pressure being a fraction of said pressure P1.

2. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

(a) said laterally translatable annular seal carrier means being first and second seal carr respectively supporting said first and second annular resilient sealing elements; and

(b) at least one of said first and second seal carriers being substantially hydraulically fc balanced in the axial direction.

3. The laterally translatable pressure staged shaft sealing mechanism of claim 2, comprising:

(a) a bulkhead being located in sealed relation to housing and defining axially spaced annu seal carrier recesses; and

(b) said first and second seal carriers being located within said axially spaced annular seal car recesses.

4. The laterally translatable pressure staged shaft sealing mechanism of claim 3, comprising:

said bulkhead being substantially hydraulically force balanced in the radial direction.

5. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

said first and second annular resilient sealing elements establishing substantially equal sealing diame with said relatively rotatable surface.

6. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

said first and second annular resilient sealing elements establishing unequal sealing diameters with relatively rotatable surface.

7. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

(a) a first fluid circulation passage for circulating said first fluid at said pressure P1 for cool of said first annular resilient sealing element; and

(b) a circulation passage for circulating said second fluid at said pressure P2 within said stag pressure chamber for cooling of said first and second annular resilient sealing elements.

8. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

(a) a source of circulating coolant fluid at low pressure;

(b) an outboard seal establishing low pressure sealing with respect to said relatively rotat surface and defining a cooling chamber outboard of said second annular resilient sealing element;

(c) a cooling passage being disposed in fluid circulation communication with said cool chamber for circulation of said coolant fluid within said cooling chamber for cooling of said relati rotatable surface and said second annular resilient sealing element.

9. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

(a) a fluid circulation path being defined within said staging pressure chamber; and

(b) a fluid circulation system circulating fluid through said fluid circulation path at said stag pressure P2 for pressure staging and for removing heat buildup of said first and second annular resil sealing elements responsive to relative rotation of said relatively rotatable surface.

10. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

(a) a bulkhead being disposed in sealed non-rotatable relation with respect to said housing

having a partition defining axially spaced annular seal carrier recesses;

(b) said laterally translatable annular seal carrier means being at least two seal carriers dispo within said axially spaced annular seal carrier recesses, each of said seal carriers defining an internal annu seal groove; and

(c) said annular resilient sealing elements each being seated within a respective internal annu seal groove and having interference sealing with said respective internal annular seal groove and with s relatively rotatable surface.

11. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

a fluid circulation passage being defined by said housing for circulating said second fluid therethrough removing heat build-up resulting from rotation of said relatively rotatable surface with respect to said f and second annular resilient sealing elements.

12. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

(a) a sealing interface being defined by engagement of said first and second annular resil sealing elements with said relatively rotatable surface; and

(b) at least one of said first and second annular resilient sealing elements having a non-circu hydrodynamic geometry for wedging lubricant into said sealing interface responsive to rotation of s relatively rotatable surface.

13. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

at least one journal bearing being defined by said laterally translatable annular seal carrier means establishing a guiding relationship with said relatively rotatable surface.

14. The laterally translatable pressure staged shaft sealing mechanism of claim 13, comprising:

(a) a said laterally translatable annular seal carrier means defining at least one oper therethrough;

(b) fluid circulation through said at least one opening; and

(c) said fluid circulation reducing pressure drop across said journal bearing.

15. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

bearing means positioning said laterally translatable annular seal carrier means with respect to s relatively rotatable surface.

16. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

(a) said laterally translatable seal carrier means being substantially hydraulic force balanced the axial direction.

17. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

said laterally translatable annular seal carrier means being a single seal carrier supporting said first second annular resilient sealing elements.

18. The laterally translatable pressure staged shaft sealing mechanism of claim 1, comprising:

means circulating said first fluid for cooling of said first and second annular resilient sealing elements.

19. A laterally translatable pressure staged shaft sealing mechanism comprising:

(a) a housing being exposed to a first fluid at a pressure P1;

(b) a relatively rotatable surface being located for rotation with respect to said housing;

(c) laterally translatable annular seal carrier means being laterally movable relative to s housing responsive to lateral movement of said relatively rotatable surface;

(d) first and second annular resilient sealing elements being supported in axially spaced relat by said laterally translatable annular seal carrier means and having interference sealing relation with s annular laterally translatable annular seal carrier means and with said relatively rotatable surface defining a pressure staging chamber having a fluid at a pressure P1; and

(e) means communicating a second fluid at a pressure P2 into said pressure staging chamb said pressure P2 being a fraction of said pressure P1.

20. The laterally translatable pressure staged shaft sealing mechanism of claim 19, comprising:

(a) a bulkhead defining axially spaced annular seal carrier recesses; and

(b) a force balancing system establishing substantially hydraulic force balancing of s

bulkhead in the radial direction to minimize pressure induced deformation thereof.

21. The laterally translatable pressure staged shaft sealing mechanism of claim 19, comprising:

(a) a bulkhead defining axially spaced annular seal carrier recesses; and

(b) said laterally translatable annular seal carrier means being at least two seal carriers dispo respectively within said axially spaced annular seal carrier recesses.

22. The laterally translatable pressure staged shaft sealing mechanism of claim 19, comprising:

said seal carriers being substantially pressure balanced in the radial direction.

23. The laterally translatable pressure staged shaft sealing mechanism of claim 19, comprising:

(a) an outboard seal establishing sealing with said relatively rotatable surface and definin cooling chamber;

(b) a cooling passage being disposed in fluid circulation communication with said cool chamber for circulation of coolant within said cooling chamber for cooling.

24. The laterally translatable pressure staged shaft sealing mechanism of claim 19, comprising:

a fluid circulation system circulating fluid within said pressure staging chamber for cooling at least on said first and second annular resilient sealing elements.

25. The laterally translatable pressure staged shaft sealing mechanism of claim 19, comprising:

(a) a sealing interface being defined by engagement of said first and second annular resil sealing elements with said relatively rotatable surface; and

(b) at least one of said first and second annular resilient sealing elements having a non-circ hydrodynamic geometry for wedging lubricant into said sealing interface responsive to rotation of relatively rotatable surface.

26. The laterally translatable pressure staged shaft sealing mechanism of claim 19, comprising:

said laterally translatable annular seal carrier means being a single seal carrier supporting said first second annular resilient sealing elements.

27. The laterally translatable pressure staged shaft sealing mechanism of claim 19, comprising:

means circulating said first fluid for cooling of said first and second annular resilient sealing elements.

28. The laterally translatable pressure staged shaft sealing mechanism of claim 19, comprising:

said pressure P2 being less than half of pressure P1.

29. A laterally translatable pressure staged shaft sealing mechanism for sealing of a relatively rotat surface with respect to a housing and being exposed to first fluid at a pressure P1, comprising:

(a) bulkhead means establishing axially spaced annular seal carrier recesses;

(b) a plurality of seal carriers being located respectively within said axially spaced annular carrier recesses;

(c) a plurality of annular resilient seals being supported respectively by said axially spa annular seal carriers and having interference sealing with said relatively rotatable surface;

(d) at least one annular staging chamber being defined between adjacent annular resilient se and

(e) at least a second fluid at a staging pressure P2 being a fraction of pressure P1 being in communication with said staging chamber.

30. The laterally translatable pressure staged shaft sealing mechanism of claim 29, comprising:

(a) said plurality of annular resilient seals being at least three annular resilient seals includin first annular resilient seal and a last annular resilient seal;

(b) said first annular resilient seal being exposed to a first differential pressure; and

(c) said last annular resilient seal being exposed to a differential pressure which is less than first differential pressure.

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